CONSOLIDATED INFORMATION TECHNOLOGY SERVICES TASK ASSIGNMENT (TA)

1. **TITLE:** (D320) AirSTAR GROUND FACILITIES (AirSTAR-GF) SOFTWARE DEVELOPMENT

    TA No: RDG001-Rev9

    Task Area Monitor: **Alternate Task Area Monitor:**

    NASA POC: **Software Control Class:**   Low Control

    Type of Task: Non-Recurring Task

2. **BACKGROUND**

The GTM is a 5.5% dynamically scaled model of a transport twinjet aircraft that is operated as a Remotely Piloted Vehicle (RPV). The GTM, as part of the Airborne Subscale Transport Aircraft Research (AirSTAR) project, will support focused research in Aviation Safety & Security, with primary emphasis on in-flight validation of flight control algorithms and safety enhancement systems involving high-risk conditions. The subscale vehicle flight test capabilities of the GTM will facilitate the study of advanced flight-controls research concepts including:

¿ Investigating technologies for preventing and recovering from control-upset conditions due to on-board failures, aircraft damage, pilot error, or external disturbances.

¿ Gathering aerodynamic data for off-nominal flight conditions (e.g. large angle-of-attack and sideslip conditions).

¿ Investigation of new aerodynamic technologies - for example, a new wing design.

Operation of the GTM will require ground support infrastructure including pilot controls, data telemetry, voice communications, tracking and computing resources. Due to the GTM¿s currently limited on-board computational capability, research flight control/management algorithms will be hosted in ground support computing resources.

The AirSTAR Ground Facilities will be comprised of two elements:

1) A Mobile Operations Station (MOS) to be used at remote sites to fly the GTM during the conduct of flight control, aerodynamic, flight dynamics, and other research flight experiments.

2) A Base Research Station (BRS) at LaRC for flight experiment algorithm development, hardware-in-the-loop simulation, pilot training, and piloted simulation of flight experiments prior to flight, and monitoring/observation during flight experiments.

The MOS will transmit commands to and receive data and camera video from the GTM, provide the means to control the GTM, monitor its dynamic state, performance, and position within a specified flight test area, and provide video tracking of the GTM. The GTM will be

manually flown through the MOS via a side-stick controller or automatically via control laws in a ground-based computer. The GTM can be manually flown via a hobbyist R/C box for takeoff and landing, for flights to checkout onboard instrumentation and for safety backup intervention.

The primary functions of the GTM ground facilities will be achieved via four primary user stations:

1) Flight Test Director Station - Responsible for coordinating and conducting flight test experiments.

2) Research Pilot Station - Responsible for closed-loop control of GTM aircraft during flight test.

3) Researcher Station - Responsible for developing specific flight control algorithms and guiding implementation of flight test.

4) Safety Pilot Station - Responsible for research pilot backup and assuming control of GTM aircraft upon the occurance of reserach system failures/faults.

Note: The AirSTAR Ground Facilities requirements documents will be submitted directly to the task lead.

3. OBJECTIVE

The contractor shall complete the following AirSTAR Ground Facilities (AirSTAR-GF) software development subtasks organized into three projects:

PROJECT (1) - DISPLAY DEVELOPMENT

Subtask 1): Develop Synthetic Out-The-Window (SOTW) Applications including an 'OpenFlight' model of the GTM aircraft that can, along with appropriate Southeastern Virginia databases built for the SVS CAB/GA project, be integrated into a real-time, Matlab/SIMULINK-based GTM simulation. Includes the addition of a model for the airfield designated 3IVA (Aberdeen - private) located in Smithfield VA.

Subtask 2): Utilize real-time sensor/state data received from GTM aircraft during flight tests to generate real-time tactical, strategic and maintenance/monitoring displays for the Flight Test Director, Researcher and Research Pilot stations. The contractor shall include development and implementation of the capability to merge/overlay captured live video into source material obtained by the AvSP SVS projec and SOTW displays. The captured window should allow symbology to be overlaid and aligned on the video image.

Subtask 3): Develop Graphical User Interface applications to provide the Flight Test Director, Researcher and Research Pilot the capability to manipulate desired parameters related to flight test experiment and SOTW/simulation control and management. Develop interfaces between the GUI applications and the applications using the parameters.

PROJECT (2) - SAFETI LAB SYSTEM ADMINISTRATION

Subtask 4): The contractor shall continue to provide System Administration services for the SGI Octane computer located in the System and Airframe Failure, Emulation Testing and Integration (SAFETI) Laboratory.

PROJECT (3)   BRS, MOS, SAFETI HARDWARE / SOFTWARE REFRESH INTEGRATION

Subtask 5): The current suite of workstations, monitors and peripherals in the Base Research Station (BRS), Mobile Operations Station (MOS) and SAFETI lab are no longer feasible to support, nor meet the requirements of FY09 AirSTAR flight tests. The contractor shall acquire, test and integrate sufficient workstation, graphic cards, monitors and peripherals with the baseline Flight Deck Research System (FDRS) to assist the Task Area Monitor (TAM) in determining the specifications required to refresh the approximately twenty systems in the BRS and MOS.

Subtask 6): The current Out-The-Window (OTW) displays in the SAFETI lab are unsupportable. The contractor shall evaluate spherical display and other technologies, to include acquisition, testing and integration with the baseline Flight Deck Research System (FDRS) to assist the TAM in determining the specifications for a complete refresh as required.

4. **GENERAL IT SUPPORT SERVICES**

    Services Specified Through Exhibit A:

Refer to Exhibit A, Inventory of Equipment and Software (attached), that has been completed to define the required General IT Support Services.

The services of System and IT Security Administration shall be provided for those systems for which "System and IT Security Administration Required" is checked in Exhibit A. The level of security shall be consistent with the information category identified by the code checked for each such system (see NPG 2810.1). If these services are not required for the system as a whole, they shall be provided for any isolated processors where the information category code is entered in the SSA column.

Any system software, application software, or database software that is licensed to run on a particular item of equipment is entered in the respective column for that item. Software that does not require a license is also included if it is relevant to any of the required services.

The services of Hardware Maintenance (HM), System Software Management (SSM), Applications Management (AM), and Database Administration (DBA), are required for the items of equipment or software that are checked in the respective columns of Exhibit A.

Maintenance of Software Developed By or For LaRC:
Software Identification: AirSTAR Ground Facilities (AirSTAR-GF) Software Development

LaRC Software Manager:

Software Class: Low

Software Description:Software Identification: AirSTAR Ground Facilities (AirSTAR-GF)Software Development

LaRC Software Manager:

Software Class: Low

Software Description: AirSTAR-GF Software will be comprised of applications developed to:
(1) Provide an 'Open Flite' model, with terrain databases, to be used in the Synthetic Out-The-Window (SOTW) application to visualize the output of a real-time, Matlab/SIMULINK-based GTM simulation.
(2) Utilize real-time sensor/state GTM data to generate real-time tactical, strategic and maintenance/monitoring displays for flight test participants.
(3) Provide Graphical User Interfaces allowing flight test participants to manipulate desired parameters of the real-time, Matlab/SIMULINK-based GTM simulation, and other applications.

This software will control configuration and initialization of the Generic Transport Model (GTM) Flight Test system, data format translation, and data/synthetic Out-The-Window display on the various displays in the Mobile Operations Station (MOS).
This software will be written in C and/or C++, and will be run on the various Windows-based PC's in the MOS.

General IT Support Services Performance Metrics

Performance Standard: The applications software to which these services apply is fully operational and kept up-to-date with no significant disruption in capability.

Performance Metrics:

Exceeds: "Meets" and improvements are recommended and adopted; or users rate help in the use of applications very good to excellent.

Meets: The inventory, including status, of application software is current and accurate. Upgrades are installed and fully operational within 5 days of receipt (or approval, if later) with no loss of data. Users rate operation and help in use of the applications satisfactory.

Fails: Any of the requirements of this subsection (a through h) is not satisfied. Users rate operation and help in use of the applications less than satisfactory.

Performance Standard: Consultation meets customer needs. Required reports are accurate and complete

Performance Metrics:

Exceeds: Consultation and reports go beyond customer needs and are considered expert.

Meets: Consultation and reports address requirements adequately.

Fails: Any of the requirements (a,b,or c) of this subsection is not met.

Performance Standard: Documentation covering the use of application software covered by this requirement is complete, understandable, and up-to-date.

Performance Metrics:

Exceeds: Documentation is error free, complete and up-to-date. Significant improvements have been made in the clarity of documentation or documentation is proactively sought from all sources.

Meets: Documentation is complete with only minor errors noted

Fails: One or more required documentation components are not available or errors are noted that could compromise the operation or integrity of the applications.

5. SYSTEM AND APPLICATION DEVELOPMENT SERVICES

Project Title: AirSTAR Ground Facilities Display Development

LaRC Software Manager:

Software Software Control Class: Low

Responsibilities of Contractor and LaRC personnel:LaRC personnel will assist Contractor with hardware/software integration if necessary.

Requirements:
Develop Synthetic Out-The-Window (SOTW) Applications including an 'Open Flite' model of the GTM aircraft that can, along with appropriate research terrain databases (using source material obtained by the AvSP SVS project), be integrated into a real-time,

Matlab/SIMULINK-based GTM simulation. Includes the addition of a model for the airfield designated 3lVA (Aberdeen - private) located in Smithfield VA.

Utilize real-time sensor/state data received from GTM aircraft during flight tests to generate real-time tactical, strategic and maintenance/monitoring displays for the Flight Test Director, Researcher and Research Pilot stations. The contractor shall include development and implementation of the capability to merge/overlay captured live video into source material obtained by the AvSP SVS projec and SOTW displays. The captured window should allow symbology to be overlaid and aligned on the video image.

Develop Graphical User Interface applications to provide the Flight Test Director, Researcher and Research Pilot the capability to manipulate desired parameters related to flight test experiment and SOTW/simulation control and management.

Constraints:
Displays for the Researcher and Test Flight Director are in the low control class, but the displays for the Research Pilot and Safety Pilot may be determined to be in the high control class.

Acceptance Criteria:
AirSTAR Ground Facilities display software shall be demonstrated to operate as per section 3 continuously and without malfunction.

Deliverables:

Number	Deliverable Item	Deliverable Schedule
1	1	AirSTAR-GF display application software shall be demonstrated to integrate all required types of GTM sensor/state/control data into a synthetic Out-The-Window display with GUI interfaces for flight test participants. A document describing the software's functionality and brief details regarding basic software constructs shall be included. Software and documentation shall be completed, tested and delivered by TBD

Project Title: SAFETI Lab System Administration

LaRC Software Manager:

Software Software Control Class: Low

Responsibilities of Contractor and LaRC personnel:The contractor shall provide System Administration services for specified computer(s).

Requirements:
The contractor shall provide System Administration services for the SGI Octane computer located in the System and Airframe Failure, Emulation Testing and Integration (SAFETI) Laboratory.

Constraints:
None.

Acceptance Criteria:
System administration services shall be provided in accordance with accepted practices

Project Title: BRS, MOS, SAFETI HARDWARE / SOFTWARE REFRESH INTEGRATION

LaRC Software Manager:

Software Software Control Class: Low

Responsibilities of Contractor and LaRC personnel:The contractor shall provide hardware / software integration services for workstation / peripheral refresh in the BRS / MOS / SAFETI lab. LaRC personnel will assist Contractor with hardware/software integration if necessary.

Requirements:
The contractor shall identify, acquire, test and integrate with the existing baseline software candidate refresh items for the BRS / MOS / SAFETI lab. The items include but not limited to workstations, graphic cards, audio mixers, and displays. After initial configuration / testing candidate hardware items will be returned to the LaRC.

Constraints:
None

Acceptance Criteria:
Candidate hardware will work with the AirSTAR Ground Facilities display software as per section 3 continuously and without malfunction

6. WORK-AREA SPECIFIC SERVICES

Work Area Title: Program Management support for the AirSTAR Ground Facilities

LaRC Manager:

Work Area Description: Provide program management support for the AirSTAR Ground Facilities (AirSTAR-GF) being developed to support Generic Transport Model (GTM) flight test activities. Support includes the development and
maintenance of an integrated schedule to track all phases of the AirSTAR-GF development (including physical and software model development, software and simulation development, and ground station component ntegration).

Work Area Requirements: The Contractor shall provide program management support to the LaRC AirSTAR Ground Facilities (AirSTAR-GF)project team. This support includes the development and maintenance of an integrated schedule to track all phases of the AirSTAR-GF
development (this includes physical and software model development, software and simulation
development, and ground station component integration).

The Contractor will work with the Project Analyst for the GTM model build team (TA RBL002 Rev 2) as well as key members from the other development teams to create and baseline an Integrated Master Schedule.
As part of the process of creating the Integrated Master Schedule, the Contractor will work with each of the AirSTAR-GF development teams to identify interfaces across the teams and track those interfaces as the
Project progresses. The Contractor will update the Integrated Master Schedule on a regular basis (as determined by the AirSTAR-GF Team) and provide updates on the Project's progress.
When changes to the baseline plan are necessary, the Contractor will document those changes (i.e., change
requests) and evaluate their impact, including identifying any risks associated with the proposed changes, and communicate their impact to the GTM-GF Team. For approved changes, the schedules will be modified and changes will be communicated to the whole Team.
The Contractor will provide other program management support activities on an as needed basis as requested by the AirSTAR-GF Team.

7. Exhibit A

Exhibit A

8. SPECIAL SECURITY REQUIREMENTS

None.

9. SOFTWARE ENGINEERING PROCESS REQUIREMENTS

The Software Control Class requirements of this TA are determined to be "Low", therefore the software acquisition & control process described in the ConITS master TA SL001 shall apply to this TA.

10. JOINT REVIEW SCHEDULE

There will be a joint review of the work of this task at meetings to be held bi-weekly, or as scheduled by the TAM or Alternate TAM. Technical performance, timeliness, and cost will be discussed.

11. PERIOD OF PERFORMANCE

This TA is effective from 02/01/01 to 04/27/10

12. TECHNICAL PERFORMANCE RATING

In evaluating Technical Performance, quality and timeliness shall be rated as follows:

Quality: 75%   Timeliness: 25%

13. RESPONSE REQUIREMENTS

Within two weeks from receipt of this task assignment, submit to the Contracting Officer's Representative, an original and two copies of a Task Plan. This Task Plan shall address the contractor's lead personnel; specific work plans; and the associated estimated labor hours, cost, and schedule. The task plan shall include the delivery or schedule for delivery of: the Software Project Management Plan (SPMP), Maintenance Plan, and Operations Plan, when they are required. Include a signature block for concurrence by the Contract Manager and approval by the Contracting Officer's Representative.

14. FUNDING INFORMATION

Funding has not been entered for this TA.

15. MILESTONES

None required.

16. DELIVERABLES

None required.

17. FILE ATTACHMENTS

Others1